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OF THE

MASSACHUSETTS ASSOCIATION

OF

BOARDS OF HEALTH

An Official Quarterly Record of
Information for the Public

DECEMBER, 1898

Proceedings of the October Quarterly Meeting

Subjects: Infant Mortality in Massachusetts — Advantages of Hospitals for Infectious Diseases and of Anti-toxine in Diphtheria

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VOLUME VIII NUMBER 4

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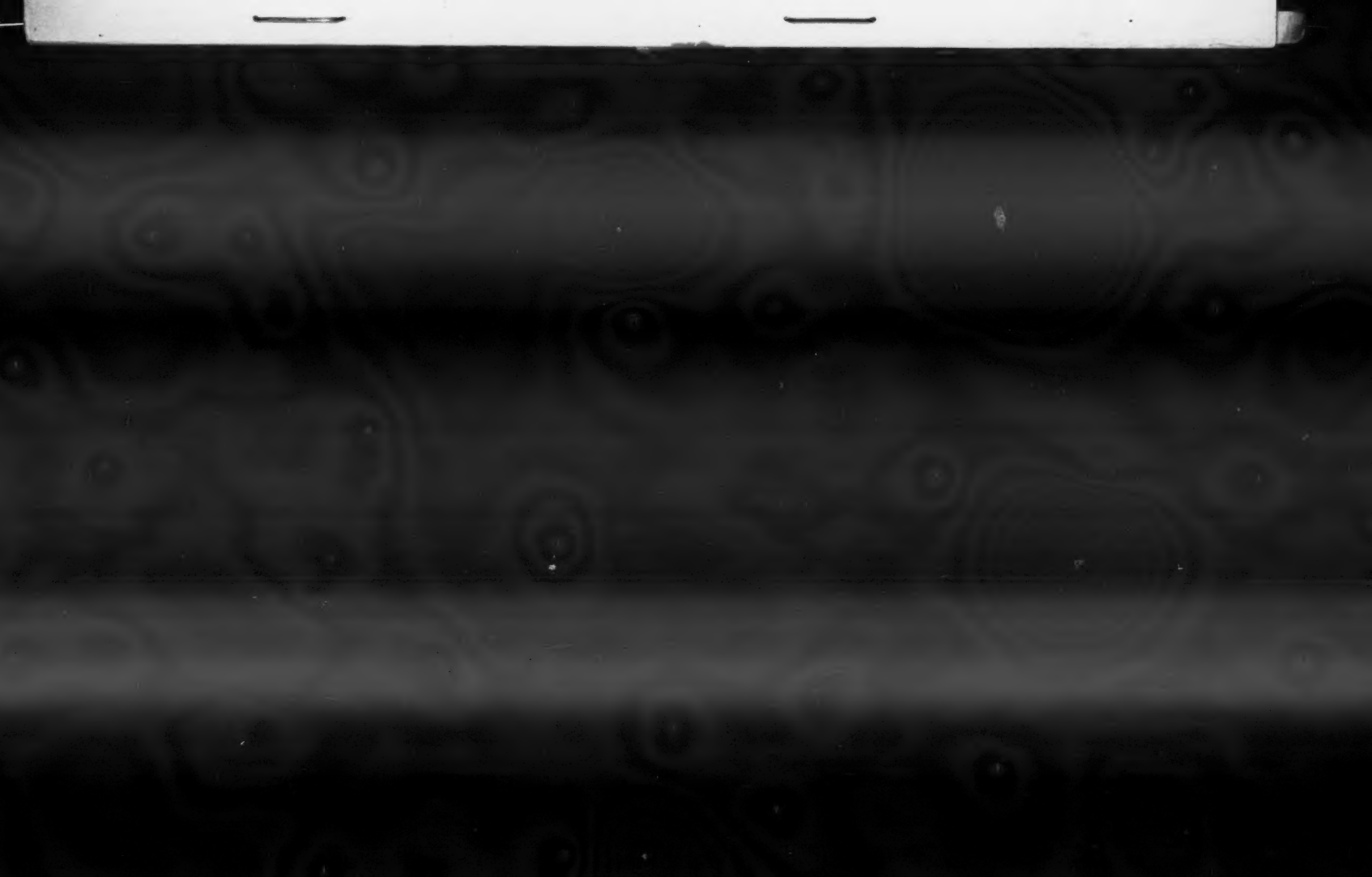

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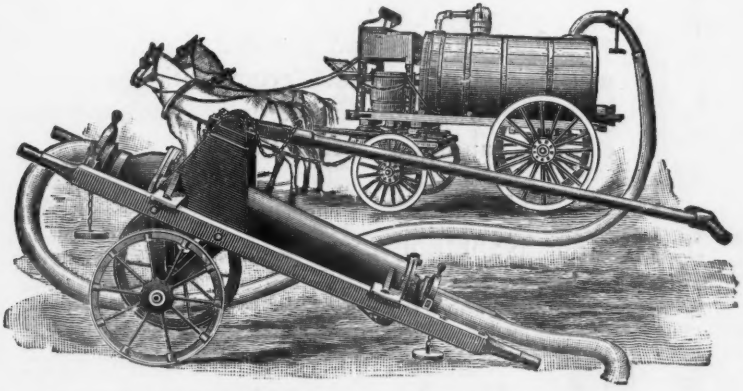

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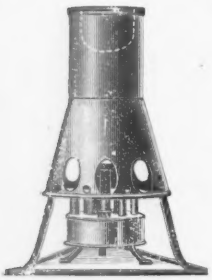

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JOURNAL OF THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH

October Meeting, 1898

SUBJECTS: Infant Mortality in Massachusetts — Advantages of Hospitals for Infectious Diseases and of Anti-toxine in Diphtheria

THE JOURNAL OF THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH.

THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH was organized in Boston in March, 1890, with the following objects: the advancement of sanitary science in the Commonwealth of Massachusetts; the promotion of better organization and co-operation in the local Boards of Health; the uniform enforcement of sanitary laws and regulations; and the establishment of pleasant social relations among the members of the Association.

All persons holding appointments as members of a Board of Health in a Massachusetts city or town, the executive officers of such a local board, and the members of the State Board of Health are eligible to membership. Other persons may be elected members by vote of the Association. The annual dues are one dollar and fifty cents, and should be paid to the Treasurer, James B. Field, M.D., 329 Westford Street, Lowell, Mass.

The Association holds four regular meetings each year, the annual or January meeting always being held in Boston.

THE OFFICIAL JOURNAL OF THE ASSOCIATION is a quarterly publication, containing the papers read at the meetings, together with verbatim reports of the discussions following them. No part of this matter is printed in any other periodical.

The JOURNAL will present, from quarter to quarter, a fair and adequate picture of the progress of practical sanitary science as applied to the needs of a modern community. The various subjects which are reviewed in the quarterly meetings of the Association are treated by experts qualified to speak from daily experience in Public Health offices, who, as men of science, are careful to be scientific and comprehensive, and who, as public officers, are no less careful to speak pertinently and so as to be easily intelligible to the layman.

The JOURNAL, in a word, appeals to all whose interests touch the questions of sanitation and hygiene,— to the architect, the school-committee-man, the manufacturer, the contractor, and, above all, to the busy practitioner who has no time for any reading but what is brief and to the point.

The subscription price of the JOURNAL is one dollar a year, payable in advance. Single numbers, twenty-five cents. It is on sale at the Old Corner Bookstore, and at Smith & McCance's Bookstore, 57 Bromfield Street, Boston.

All communications to the Association should be addressed to the Secretary, **EDWIN FARNHAM, M.D., City Hall, Cambridge, Mass.**

Subscriptions and all business communications should be sent directly to the publishers,

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JOURNAL OF THE

MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH.

ORGANIZED 1890.

[The Association as a body is not responsible for statements or opinions of any of its members.]

VOL. VIII. December, 1898. No. 4.

OCTOBER MEETING

OF THE

Massachusetts Association of Boards of Health.

The quarterly meeting of the Association was held at the Franklin House, Lawrence, on the afternoon of Oct. 27, 1898. Mayor Eaton, of Lawrence, was present, as the guest of the Association. In the absence of the President the meeting was called to order by Dr. S. H. Durgin, Vice-President, who said: —

Gentlemen, we are obliged to begin our meeting, if we are to get through with our work this afternoon. I am sorry to call you from pleasure to business. We have submitted for new membership the following names, which have been approved and recommended by the Executive Committee: —

DR. J. F. WINCHESTER . . . . . Lawrence.
DR. FRANK W. SAWYER . . . . . Chelsea.

What is the pleasure of the Association? The Executive Committee also has submitted for its approval the name of Dr. H. G. Stetson, of Greenfield, Mass., which the committee approves. What is your pleasure?

Drs. Winchester, Sawyer, and Stetson were elected to membership.

The records of the meetings held April 28, at the Woodland Park Hotel, Auburndale, and July 28, at Gallop's Island, were read and approved.

THE CHAIRMAN.— Is there any incidental business to come before the meeting? If not, the first paper on the programme is that upon Infantile Mortality, by Dr. S. W. Abbott, Secretary of the State Board of Health of Massachusetts.

INFANT MORTALITY IN MASSACHUSETTS.

BY SAMUEL W. ABBOTT, M.D.

The most important work of local boards of health, beyond question, is the management and control of infectious and preventable diseases or causes of death. In those municipalities where this branch of sanitary work has been efficiently and thoroughly carried out, the health authorities have had the satisfaction of witnessing a very decided fall in the death-rate from infectious diseases, and a consequent saving of human life,— a saving which is worthy of commendation as much as is the heroic act of the life-saving crew which breasts the storm and rescues a shipwrecked and dying company from some unfortunate craft upon our storm-beaten New England coast. 'Tis true that the life-saving crew have imperilled their own lives; but the grand result is the same in either case,— the humanitarian result of saving human life.

That this saving of human life has actually resulted, and that, too, in a very large degree, as a consequence of the well-directed efforts of sanitary authorities, cannot admit of a reasonable doubt.

But, while these evidences of the great advantage of sanitary measures are clearly demonstrated, it still remains a fact that the general mortality of the State has not materially changed in a period of forty years or more, since, while the death-rate from certain diseases has diminished, that of others has increased in a corresponding degree. How, then, may the balance of mortality be so influenced that there may be a decided fall in the general death-rate (as has actually happened in England)?

I have carefully examined the list of diseases in which an increased death-rate has occurred in Massachusetts, and have no hesitation in stating that boards of health in our large cities will find a fruitful field of work in the study of the question of infant mortality, its causes, and the prevention of its excessive prevalence.

Another reason for encouragement in this special direction is the fact that many lives saved in infancy are saved for a long and useful life, and are, in fact, so much added wealth to the community at large. Dr. Schlossman says, "The death of every child constitutes a definite loss of national wealth."* On the other hand, energy expended in saving the lives of the aged from the inroads of disease at the later years of life only saves this class at a period when they are most likely to become a burden to the community.

Of so great importance is this subject that a recent writer says, "The future of our country depends most decidedly upon the question of the diminution of infant mortality."† The writer of these words was a Frenchman, a native of a country in which the death-rate has several times in the past ten years exceeded the birth-rate, and where special need for vigorous measures appears to be in order. If, then, there is encouragement in France for the adoption of stringent measures to prevent the decadence of national life, and consequently of national prosperity, there is also a like encouragement in our own State and a like incentive for action.

There are already communities in Massachusetts in which active sanitary work is necessary in this direction, as well as in France.

It is to this subject, therefore, that I now invite your attention. I shall present the subject under three heads.

(1) The prevalence of infant mortality in Massachusetts.

(2) Its causes and attendant conditions.

(3) Methods of prevention.

1. *Prevalence.*— The best measure of the infant mortality of a given population is that which assumes the births as a standard. It is a well-known fact that the census enumeration of infants is seriously defective;‡ and this statement applies to nearly all countries in which census enumerations are taken, and especially in the United

* Zeitschrift f. Hygiene, vol. xxiv. (1897) p. 95.

† Dr. Barthes, Revue d'Hygiene, July, 1898, p. 646.

‡ See Mr. E. B. Elliot's paper in United States Census of 1870, Ninth Census, vol. ii. p. 517.

States. On the other hand, the enumeration of the births in Massachusetts, at least, is probably not far from correct. Hence this is much the better standard. In the following table the infant mortality of Massachusetts for a period of forty years is presented as a ratio per 1,000 births: —

TABLE I.— INFANT MORTALITY.

MASSACHUSETTS. 1856–95, FORTY YEARS.

YEARS.	Births in year ending June 30.	Deaths under one.	Death-rate under one per 1,000 births.	YEARS.	Births in year ending June 30.	Deaths under one.	Death-rate under one per 1,000 births.
1856	33,593	4,226	125.8	1876	43,340	6,700	154.6
1857	34,919	4,160	119.2	1877	41,635	6,343	152.4
1858	35,210	4,197	119.2	1878	41,622	6,189	148.7
1859	34,425	4,175	121.3	1879	41,010	5,855	142.8
1860	36,180	4,821	133.2	1880	42,420	7,190	169.5
1861	35,570	5,167	145.2	1881	44,715	7,389	165.2
1862	34,064	4,216	124.0	1882	45,280	7,445	164.4
1863	31,276	4,545	145.2	1883	45,993	7,515	163.3
1864	30,004	4,693	156.4	1884	48,666	7,735	158.9
1865	30,481	4,869	159.6	1885	48,710	7,625	156.5
1866	31,295	4,699	150.1	1886	49,214	7,848	159.5
1867	34,792	4,763	136.9	1887	52,364	8,514	162.6
1868	35,775	5,421	151.5	1888	53,770	8,870	164.9
1869	35,684	5,368	150.5	1889	56,140	9,105	162.2
1870	37,753	6,206	164.4	1890	57,823	9,625	166.5
1871	38,770	5,996	154.7	1891	60,246	10,186	169.0
1872	41,393	8,390	202.7	1892	63,969	10,649	166.5
1873	43,563	7,911	181.6	1893	66,492	10,990	165.3
1874	45,570	7,489	164.3	1894	67,574	10,899	161.3
1875	44,828	7,712	172.0	1895	66,746	10,564	158.2
Total	725,145	109,024		Total	1,037,729	167,236	
Mean	–	–	150.3	Mean	–	–	161.2

Mean of whole period 156.7

Strictly speaking, the death-rate of infants under one year is obtained by comparing the deaths of such infants occurring in a year with the mean number of infants under one living throughout a year; and "this number must lie between the annual number of births and that number diminished by the deaths under one. It would be

nearer the latter than the former number on account of the excess of deaths in the first months of life." (Dr. Farr.)

For the sake of uniformity in comparison with the statistics of other States and countries, the deaths under one, in the foregoing table, are compared with the births. The births in the first line (1856) are those which occurred between July 1, 1855, and June 30, 1856, inclusive, and so on through the table, the births in the last line being for the year ending June 30, 1895.*

The deaths under one in the same table are those of the calendar years ending Dec. 31, 1856, 1857, etc. The births in this whole period were 1,762,874; and the deaths under one year were 276,260, which is equivalent to a death-rate of 156.7 per 1,000 living births, as a mean of the whole period.

Dividing the whole time into ten and twenty year periods, the infantile death-rate of the first twenty years was 150.3 and that of the second twenty years was 161.2 per 1,000 births. The difference in the rates of the ten-year periods is much greater, chiefly on account of the disturbing effect of the epidemic years 1872 and 1873, when cholera infantum prevailed to an unusual degree. The infantile death-rates of the four ten-year periods were, respectively, 134.2, 164.2, 157.8, 163.6. By this it appears that the infantile death-rate has increased considerably when we compare the first twenty years with the last twenty, and especially when the first and last ten years are compared. If the figures for the two years 1872 and 1873 were to be omitted from the table, the infantile death-rate of the remaining eight years in the ten-year period 1866–75 would be reduced to 1565.

The death-rate of infants under one diminished with considerable uniformity during the five years (1891–95) from 169.0 per 1,000 births in 1891 to 158.2 in 1895, with an increase to 167.0 in 1896, and a decided drop to 148.1 in 1897.

Infant Mortality of Cities.— For the purpose of presenting the infant mortality of the cities of Massachusetts, a ten-year period has been selected; and, since only eleven out of the thirty-two cities embraced in this summary existed as incorporated cities at the beginning of the period under consideration, the ten years 1881–90 are selected for examination. The later ten-year period 1886–95 would

* For explanation of this method see Dr. A. Chalmer's Life Table of Glasgow.

have been selected; but, unfortunately, the presentation of the deaths by ages in the different cities in the State appears to have been abandoned in the registration reports since 1890.

In the following table the cities are arranged with reference to their comparative rank, so far as infant mortality is concerned: —

TABLE II.—INFANT MORTALITY OF MASSACHUSETTS CITIES.

TEN YEARS, 1881–90.

	Births.	Deaths, 0—1.	Infantile mortality.*	Rank, the State =100.
Fall River	18,557	4,449	239.7	149
Lowell	18,684	4,158	222.5	139
Lawrence	11,724	2,508	213.9	133
Boston	117,574	22,134	188.2	117
Salem	6,998	1,264	180.6	112
New Bedford	9,642	1,713	177.7	111
Chicopee	3,583	631	176.1	110
Cambridge	17,262	2,974	172.3	107
Holyoke	11,730	1,972	168.1	105
Chelsea	6,446	1,076	166.9	104
Springfield	10,276	1,616	157.3	98
Haverhill	5,748	903	157.1	98
Worcester	21,211	3,300	155.6	97
Marlboro	3,363	520	154.6	96
Somerville	7,894	1,311	154.3	96
Newburyport	3,137	479	152.7	95
Brockton	4,902	720	146.9	91
Pittsfield	3,563	516	144.8	90
Lynn	11,856	1,668	140.7	88
Taunton	6,571	923	140.5	87
Gloucester	5,726	795	138.8	86
Northampton	3,021	410	135.7	84
Fitchburg	4,804	645	134.3	84
Malden	4,745	633	133.4	83
Everett	1,956	258	131.9	82
Waltham	3,660	482	131.7	82
Medford	2,025	265	130.9	81
Woburn	3,771	479	127.0	79
Quincy	4,242	526	124.0	77
Beverly	1,817	216	118.9	74
North Adams	5,310	611	115.1	72
Newton	4,370	489	111.9	70
Urban	346,168	60,544	174.9	109
Rural	163,119	21,127	129.5	80
THE STATE	509,287	81,671	160.4	100

* Deaths of infants under one year per 1,000 births.

Of the first seven cities in this table, all except Boston are cities in which the cotton and woollen industries largely predominate. In the first three the tenement-house population is also unusually large.

In the twenty third report of the State Board of Health, page 836, attention was also called to the fact that the mortality from cholera infantum, which is one of the chief factors of the death-rate under one year, bears a direct relation to the ratio of married women employed away from their homes; and this ratio reaches its maximum in Fall River, where this class constitutes 3.1 per cent. of the total population.

There are also several smaller towns, not included in this list (Webster, Ware, Adams, and Millbury), in which the same class of manufactures is conducted, and which have a considerable tenement-house population, with a high rate of infant mortality.

The cities of Haverhill, Marlboro, Brockton, and Lynn, each having an infantile death-rate below that of the State at large, are all shoe manufacturing towns, in which the tenement-house population is comparatively small.

Near the bottom of the list are the cities of Malden, Everett, Medford, and Newton, in which the residential population largely predominates. The manufacturing population constitutes but a small fraction, and the infantile death-rate is much less than that of the State.

The death-rate of infants for the State at large was 160 per 1,000 births, while that of the combined urban population was 175 per 1,000 and that of the rural population was 129.

How do the foregoing figures compare with those of other populous communities and nations? The infantile death-rate differs much in different countries, since in some communities it amounts to as much as one-third of the births and in others it is not more than one-tenth. Table III. (page 140) gives the infant mortality of several foreign nations, and comprises the results of observations of several million cases of deaths in infancy.

From this table it appears that the infant mortality of Massachusetts is greater than that of Sweden, Ireland, Scotland, England, and Belgium, but less than that of the other countries named in the table, that of Bavaria being greater than our own by 78 per cent.

TABLE III.—INFANT MORTALITY IN DIFFERENT COUNTRIES.

DEATHS UNDER ONE PER 1,000 BIRTHS.*

COUNTRIES.	Years.	Infant mortality per 1,000 births.	COUNTRIES.	Years.	Infant mortality per 1,000 births.
Ireland . . .	1884–88	94	Italy	1884–91	192
Sweden . . .	1881–90	97	Prussia . . .	1886–92	207
Scotland . . .	1885–90	120	Hungary. . .	1884–97	212
England . . .	1885–91	144	Austria . . .	1886–87	246
Belgium . . .	1881–91	159	Saxony . . .	1886–92	281
France. . . .	1885–90	165	Bavaria . . .	1879–88	287
Holland . . .	1885–90	179	MASSACHUSETTS	1876–95	161

Of what causes is this infant mortality composed? Upon this point I shall present the results of observations of the five years 1892–96. During this time there occurred in Massachusetts 66,805 deaths of infants under two years of age; and of this number 54,867, or 82 per cent., were under one year old.

Let us analyze these figures more closely, with reference to their factors and the question whether any of the causes therein embraced are preventable by human agency.

Table IV. (see page 141) presents the causes of death as given in the Registration Reports for the years in question.

Of this list the deaths from diphtheria, whooping-cough, cholera infantum, and other diarrhœal diseases and violence are more or less preventable; and, in a measure, those from tubercular causes may be reckoned in the same category. These together constituted 45 per cent. of the whole number of deaths of infants under two years of age.

In the case of *diphtheria*, thanks to the efficient co-operation of local boards of health with the State Board in the matter of anti-

* Mostly from Dr. Eross's paper in Koch's *Zeitschrift*, vol. xix. (1896) p. 371.

TABLE IV.—INFANT MORTALITY.—CAUSES OF DEATH.

MASSACHUSETTS. FIVE YEARS, 1892–96.

CAUSES.	Under one year.	1–2 years.
1. Whooping-cough	942	339
2. Cholera Infantum	11,708	1,663
Diarrhœa	1,467	198
Enteritis	3,005	502
3. Diphtheria and croup	562	1,276
4. Tubercular diseases:		
Tabes Mesenterica	4,344	444
Phthisis	624	311
Hydrocephalus	1,090	563
5. Pneumonia	3,741	1,720
Bronchitis	2,826	819
6. Cephalitis	2,831	1,284
Convulsions	2,754	683
7. Heart Disease	741	42
8. Infantile diseases	843	5
Premature birth	5,064	2
Atrophy and debility	5,493	149
9. Violence	805	206
From suffocation:		
Under one 628		
One to two 9		
10. Unknown	589	57
11. All other causes	5,438	1,675
Total	54,867	11,938

toxine distribution and gratuitous culture work, the death-rate is already diminishing.

No specific mention of *whooping-cough* is made in the Statutes. It is, nevertheless, a disease dangerous to the public health, since about three hundred children die from it every year in this State. In some

communities the dangerous position is taken that this disease is not a public danger, and children are allowed to attend school while suffering with it. It would seem entirely proper to place this disease upon the list of causes for which a pupil should be excluded from school when suffering with it. I have made special reference to whooping-cough since, unlike many of the infectious diseases of children, it is most destructive among infants in the first year of life, while diphtheria and scarlet fever prove most destructive in the following years from one up to five.*

A slight reduction has also taken place in the death-rate from *tubercular* causes among infants during the past forty years, but not nearly so great as that which has occurred among adults.

The deaths from *violence* were not well classified until 1887, and it is difficult to compare present conditions with those which prevailed before that date. It is quite certain, however, that the death-rate of infants from violent causes has very considerably increased during the past half-century.

Deaths from suffocation among infants were uncommon in Massachusetts until recent years. During the five years 1892–96, 628 infants under one year old were recorded as having died from suffocation; and it is probable that the majority of these were due to overlaying in bed, and occurred in the first few days or weeks of infant life. Such deaths are of frequent occurrence in English cities, and often occur on Saturday or Sunday nights, the mother being intoxicated with liquor.

The *diarrhœal* diseases of infants contributed 18,543 deaths in the five years, or nearly 28 per cent. of the infant mortality. The death-roll from this group of diseases appears to have continued with but little cessation or reduction for the past fifty years; and it seems reasonable that the intelligent efforts of boards of health and of all sanitary organizations, whether official or non-official, may be exerted toward staying the progress of this factor of infant mortality with some degree of success.

* See Twenty-eighth Report of State Board of Health, p. 785.

II.

Let us now consider the causes and attendant conditions of infant mortality as they exist in this Commonwealth.

Natural Conditions which are not Preventable.

Sex.— The rate of mortality among infants differs in the two sexes. Male infants die in the first year of life at the rate of 1,200 boys for each 1,000 girls in equal numbers living. That is to say, the infantile death-rate of boys is 20 per cent. higher than that of girls of the same age in this State.

Temperature.— The greatest mortality among infants occurs in the hot season of the year, since the death-rate from cholera infantum, the chief factor of infant mortality, is highest in this season. The deaths from cholera infantum registered in the months of June, July, August, and September, 1895 and 1896, constituted about 93 per cent. of the whole number from that cause in those years (or 4,957 out of 5,334).

A decided and prolonged temperature above a daily mean of 70° F. for several days in succession is usually attended with increased infant mortality in all our cities. Table V. (page 144) presents the mean temperature in Eastern Massachusetts for the four months of June, July, August, and September, together with the ratio of cholera infantum to the total mortality for the same months for the seven years (1890–96), arranged in three groups of years according to the mean temperature of these months.

In this table, Group I. includes the three years in which the mean temperature of the four warm months was above the average of the whole period. Group II. includes the two years in which the mean temperature exactly coincides with the mean of the seven years, and in Group III. the mean temperature was below the average of the period. In these groups of years, cholera infantum appears to have borne a direct relation to the mean temperature; and, while the differences in the means are but slight, they afford a delicate index of the mortality, since the greatest differences are to be found between Groups II. and III. in each instance. These results are

TABLE V.— RELATION OF CHOLERA INFANTUM TO TEMPERATURE.

1890–96.

Groups of Years.	Years.	Mean temperature June, July, August, and September.	Cholera Infantum. Mean percentages of total mortality.
I.	1891, 1892, 1896	68.4°	6.02
II.	1890, 1894	67.4°	5.72
III.	1893, 1895	66.0°	5.25
Mean of seven years	—	67.4°	5.71

obtained by the tabulation of 18,874 deaths from this cause which occurred in the seven years 1890–96.

Preventable Causes and Conditions.

1. *Density of Population.*— The progressive aggregation of inhabitants in cities and large towns (other things being equal) coincides with an increase in the general death-rate of these communities; but, when we analyze the factors of this general death-rate, the principal increase appears in the mortality among infants. This principle involving the effect of density of population upon the death-rate was established a half-century ago by Dr. Farr, who showed that within certain limits there was a definite relation between density and mortality. He showed, moreover, so far as age periods are concerned, that children under five years of age are the greatest sufferers from this condition.* But in Massachusetts, notwithstanding an increase in the density of population from 136 per square mile in 1855, to 300 per square mile in 1895, the general

* See Registrar-general's Fifth Report of England, p. 420; also Forty-ninth Massachusetts Registration Report, 1890, p. 285.

death-rate remained practically stationary (about 19.5 per 1,000),— a fact that may be taken to show that improved sanitary conditions have nearly counterbalanced the unfavorable influence of increasing density.

If the population of Massachusetts, by Census of 1895, be divided into two groups, an urban or densely settled and a rural or sparsely settled group, the former is found to comprise about seven-tenths of the population, or 1,719,680, living in 39 cities and large towns having over 10,000 inhabitants in each, and also having a density of about 2,000 per square mile; and the smaller group of 780,503 is scattered through 314 smaller towns, with a mean density of about 100 per square mile.

The death-rates of these two groups in 1895 were as follows: —

TABLE VI.— RELATION OF GENERAL AND INFANTILE DEATH-RATES TO DENSITY OF POPULATION.

1895.	Urban Group.		Rural Group.	
	Death-rates.	Per cent. above mean.	Death-rates.	Per cent. below mean.
General death-rate: Per 1,000 inhabitants . .	19.85	4	17.38	—9
Infant mortality: Per 1,000 births	174.9	9	129.5	—20

By the foregoing table it appears that the effect of density upon infant mortality was more than twice as great as its effect upon the general death-rate, the maximum and minimum departures or differences being in the one case 4 and 9, and in the other 9 and 20.

If we take two counties in which the urban and rural conditions are still more sharply defined, the contrast is greater still. In the counties of Hampden and Bristol there are 6 cities devoted largely to manufacturing (Springfield, Holyoke, Chicopee, Fall River, New Bedford, and Taunton), in which the population is quite densely

settled. There are also 36 smaller towns, mostly containing an agricultural population and sparsely settled. In the former, the cities, the infant mortality for the five years 1886–90 was 187.4 per 1,000 births, and in the rural population it was only 119.1 per 1,000 births.

Intemperance.— It is hardly necessary to assert that intemperance is a direct cause of infant mortality. The records of every country and every city give ample proof of the assertion. The poverty, the neglect, the cruelty, which are the inevitable result of a system of licensed saloons, are all handmaids of intemperance. Cities in which intoxicating liquors are sold freely under local option laws have a higher infant mortality than those in which license is forbidden by the popular vote. In the census year 1895 the infant mortality in the 17 cities in which licenses were granted was 174 per 1,000 births. In those cities where no licenses were permitted the infant mortality was only 122 per 1,000, or but little more than two-thirds as great. In this estimate no account is taken of those few cities in which the sentiment was divided, so that a change from license to no-license or *vice versa* took place during the year in question. The records of the societies established for the prevention of cruelty to children confirm the foregoing statements, both in this country and in England.

Poverty.— Poverty implies a limited supply of those things which tend to preserve life; namely, food, clothing, fuel, shelter, and an abundance of those necessities which make life comfortable and its preservation a matter of greater probability. When the family treasury is so diminished that the necessary food is lessened, and the supply of necessary warmth in winter becomes limited, the weaklings of the flock are the first to feel the blow, and to suffer from its effects.

The effect of poverty and wealth upon the mortality of children is shown in Dr. Billings's census volume upon the Vital Statistics of Boston and Philadelphia. In the series of maps presenting the conditions prevailing in Boston, one gives the mortality of children under five in the different wards and parts of wards in the city. Ward 9 comprises two divisions, "A" and "B." "A" is the northern part of the ward, embracing the region about Cambridge Street; and "B" is that portion which includes Beacon, Chestnut,

and Mt. Vernon Streets. The social conditions of these two districts are in strong contrast, "A" containing the poor, and "B" the wealthy class. "A" had a mortality of children under five amounting to 157.1 per 1,000 living of the same age, while "B" had a mortality of only 40.4 for the same class or but little more than one-quarter as great.

A similar result is shown by comparing the wages of the operatives in two leading industries with the infant mortality in cities where such industries are conducted. The average pay of shoemakers is from 60 to 90 per cent. larger than that of cotton and woollen operatives. The infant mortality in the three shoe manufacturing cities of Lynn, Haverhill, and Brockton, for a period of ten years, 1881–1890, was 146.1; while that of the cotton factory cities of Fall River, Lowell, and Lawrence for the same time, was 227.0 per 1,000 births.

Defective Food Supply.—The natural food of the infant is: (1) its mother's milk; (2) that of a healthy nurse; (3) that of the cow, properly prepared; (4) lastly, the numerous artificial substitutes for milk.

The readers of magazines and other periodicals are treated with pictures of children of marvellous beauty, who are said to have been reared upon the different kinds of milk substitutes. All these methods of advertising appeal to the public eye, but medical men know full well the specious character of such advertisements. If the photographs of the dead infants who crowd the graveyards could be shown, the ratio of the dead to the living among those who were fed upon milk substitutes would be found to be at least ten times as great as that of the infants who were nursed at the mother's breast.

Accurate data upon this point are not to be had in this country; but Dr. Boeckh, of Berlin, has collected a great number of valuable observations bearing upon this question. He has, for several years, kept a careful record of each infant born in Berlin, with reference to the method of feeding during the first year of life. By this means he is enabled to arrange all infants in the city in groups, so that the dead of each class can be compared with the living of the same class; and these results have been published.

The results were, briefly, as follows: * —

* International Statistical Bulletin, vol. ii., No. 2, p. 14.

Mortality per 1,000 infants under one year old: —		
Among those who were fed on the mother's milk only . . .	7.4	per 1,000
Among those who were fed on the mother's milk and cow's milk,	21.4	" "
Among those who were fed on cow's milk alone	42.1	" "
Among those who were fed on milk substitutes	67.7	" "
Among those who were fed on cow's milk and milk substitutes,	125.7	" "

These figures are the result of a large number of observations (65,720 deaths), and may be considered as conclusive as to what is the best food for new-born infants.

But it is not only the quality of the food which is to blame for increased infant mortality, but also the conditions under which it is administered and the incidents to which it is subjected. Human milk is invariably fed at a uniform temperature and in a fresh condition, uncontaminated by external conditions. Cow's milk, on the contrary, and milk substitutes are fed at variable temperatures. They are too often stale or in a semi-putrid condition when administered in consequence of uncleanly methods of storage. The receptacles or bottles in which they are administered are also often unclean, the nipples and tubes attached to them being difficult to cleanse. In some cities, fortunately, the sale of bottles having long tubes has been suppressed by special ordinance. One health commissioner has claimed a large reduction in the infant mortality by the enforcement of such an ordinance and other measures of similar character.*

The Use of Opiates.— The careless and inconsiderate use of opiates among young infants is undoubtedly responsible for a portion of the loss of such infants by death. In 1888 the legislature of Massachusetts requested the State Board of Health to make an investigation with reference to the sale and use of opium; and the inquiry was intrusted to Dr. B. H. Hartwell, who made the following statement with reference to the use of opiates among infants, p. 155 (1888).

"The sale of soothing syrups and all medicines designed for the use of children, which contain opium and its preparations, should be prohibited. Whatever may be said in extenuation of its sale, without the advice of a physician, for use by adults, no one would advocate its use by the young. Especially is this so in regard to reme-

* Ordinances of the Department of Health, Buffalo, 1897, p. 47.

dies, the component parts of which are not made known to the public. If opium must be given to children, let the well-known paregoric be the form; and the minimum harm, as far as they are concerned, will be the result. It is the secret remedy which is the most popular. Many would be deterred from using a preparation known to contain opium, who would use without question a soothing syrup recommended for teething children." *

Employment of Mothers away from Home.— In his prize essay on "The Perils and Protection of Infant Life," Dr. Jones, of Liverpool, shows that the employment of mothers away from their homes has a disastrous effect upon the life of young infants. An examination of the data furnished by the Bureau of Labor Statistics of this State presents similar results, when these data are compared with the infant mortality of the different cities of the State. In Fall River, for example, the ratio of married women employed in the factories was 3.1 per cent. of the total population, the highest percentage in any city in the State; and in that city the death-rate from cholera infantum was also the highest.

I am aware that this proposition of Dr. Jones has been attacked by other writers; but, after carefully reviewing both sides of the question and comparing the statistics of our own State, I am convinced that the views of Dr. Jones are correct.

III.

What remedies can be employed to diminish the rate of mortality among infants in our State?

One class of conditions appears to be beyond the reach of human intervention. The natural condition of sex cannot be limited by human agency.

That of high temperature can best be limited by the removal of infants from the heated air of the towns to the cooler regions of the hills and mountains and the seashore. In this direction considerable good has already been accomplished by the establishment of seashore homes, harbor excursions, and similar projects which well deserve the public support.

* Report of State Board of Massachusetts, 1888, p. 155.

Poverty, neglect, and intemperance are social conditions that will only succumb to the hearty co-operation of an intelligent public opinion for the general amelioration of the condition of those classes of people among whom those conditions are prevalent.

The sale and use of opiates for the treatment of infants ought to be regulated by law. Various attempts to secure legislation with this end in view have been made in the past, but have failed in consequence of the interference and opposition of the patent medicine interest.

The Food of the Infant.— Bad feeding is, undoubtedly, the most fruitful cause of infant mortality. Hence intelligent measures intended to improve methods of infant feeding will probably result in a diminished infantile death-rate. As a general rule, the breast-fed infant survives; and but little attention is required to insure the safety of this class. A large ratio of infants are fed upon cow's milk. In many instances, this milk is unsuited for feeding infants because of its age and its want of cleanliness. This Association has devoted much attention in the past two years to the improvement of the milk supply, and herein lies a most fruitful field for improvement in the infantile death-rate. The laws in this State are sufficiently definite and protective so far as the matter of milk adulteration is concerned, but are quite inadequate so far as concerns the methods of milk production, the feeding of cows, and the sanitary condition of the dairy farms where the milk is produced.

Again, a very large part of the milk used for infant feeding in our cities comes from outside our State, and is practically beyond our control. One firm alone, which supplies Boston, receives milk from at least 1,000 dairies in New Hampshire and Maine.

Next come the numerous artificial substitutes for the mother's milk, many of them being the by-products of breweries and other establishments, which the manufacturers sell at a handsome profit. Undoubtedly, some survive under the use of artificial food; but the ignorance of the parent or nurse in preparing and administering them goes a long way toward imperilling the life of the child. Dr. Jones says upon this point: "The successful rearing of infants on artificial foods depends not only upon a sound knowledge of the kind of food suitable for infant feeding, but

also upon a practical knowledge of its preparation, of the quantity to be administered, of the intervals which ought to elapse between successive feedings; and excessive cleanliness in the most minute details is imperative for success. Artificially fed children die even yet under the most careful supervision more frequently than breast-fed children. . . . Better results are possible to-day with an increased knowledge and greater resources. Those of us who see day by day large numbers of the children of the industrial classes in hospital and at their homes cannot avoid the conclusion that the most frequent causes of the illnesses attributable to bad feeding is ignorance. Infants are fed upon 'anything that is going.' Any liquid preparation is poured into a bottle, and the child is fed thereon. The class of food-stuffs chosen is utterly inappropriate for infant feeding. This is a matter of common knowledge, and need not be further insisted upon. The children suffer and die. They are the victims of ignorance."

The French writer to whom I have already referred lays decided stress on the question of infant feeding as the one direction in which improvement is by all means most needed for the prevention of infant mortality.

How can improvement be effected in the feeding of infants? The class of population amongst whom this mortality is greatest is ignorant and slow to take up or adopt any suggestions of reform. Education must do its share of the work. Appeals to the medical profession to exert every effort to enlighten the families under their charge should be made.

I am not without a sincere hope that the great mass of published information which the medical profession and sanitary organizations have issued and distributed from time to time upon this subject in the shape of circulars has had some controlling influence in limiting the mortality of infants in general.

Another measure is by direct appeal to that sex which is most vitally interested in this subject as a humanitarian question. If the mothers in our large cities should organize with the direct object of lessening infant mortality, I have no doubt that good results would follow.

Another measure of undoubted utility is the establishment of

model dairies for the production of milk, such as have already been established in Newton, Mass., and at Providence, R.I.

The condition to which I have referred as influencing infant mortality in manufacturing cities, that of the employment of married women in the factories, may be met by legislation, and by another method,— the establishment of day nurseries, or *crèches*, where young infants may be cared for during the day and while the mother is at work. These establishments, however, should be under careful sanitary supervision, and should be subject to frequent inspection by a medical inspector.

In the extremely young infants there is an added danger in the first days and weeks of life, when extreme care is necessary in the case of puny and premature children to keep them at a fairly uniform temperature. An additional safeguard is provided in the use of the *couveuse*, or incubator, under careful watching, in order to maintain a uniform degree of heat till the weakling has acquired sufficient strength to enable it to live without the protection of this apparatus.

In conclusion, then, while very marked improvement has taken place in this State, in most directions as a result of direct sanitary work on the part of the health authorities of cities and towns, very little progress appears to have been made in limiting the death-rate of infants. That an open door in this direction presents itself to boards of health for earnest sanitary work — an opening, too, which presents an encouraging outlook — I have not the least doubt.

Beyond all question the one factor in diminishing the infantile death-rate lies in the direction of the food supply of this helpless class. Further improvement of the milk supply of our cities is still needed: the co-operation of women's sanitary associations, whose organizations should be encouraged; the intimate control by boards of health of the methods of feeding among the laboring classes; the establishment of day nurseries, or *crèches*, in manufacturing cities, under careful sanitary control; and the circulation of literature generally aimed at improvement in this line of sanitary work.

THE CHAIRMAN.— A discussion upon this paper will be commenced immediately after dinner. I understand dinner is now ready, and we will proceed to that part of the programme.

After dinner the proceedings were resumed.

THE CHAIRMAN.— Gentlemen, in order to finish our programme and make a visit to the filter bed, and get such trains as are desirable for reaching home, we shall have to hurry our matters very much now. Before resuming the regular programme, I take great pleasure in introducing to you his Honor Mayor Eaton, of Lawrence.

MAYOR EATON.— It gives me very great pleasure, Mr. President and gentlemen of the Association, to welcome to our good city the members of this Association. We extend to you every liberty and privilege the place affords.

I have been pleased to look upon this body of men. Unlike most of those whom I have met in this room, you seem to be a sad set of men. I should say that you are in some way depressed. I hardly know why you should be. It may be the business in which you are engaged. There is enough in it to make any man feel discouraged and heart-sick all the time. If you do the best you can, the public find fault with you. If you do nothing, it still finds fault. If you inspect, you are blamed; and, if you do not, you are faulty. You have to go against public sentiment, override public opinion, and enforce laws against great opposition. That is what makes you sad. If you fully realized the importance of the work you are doing, it would make you more cheerful.

We boast of our public schools because they educate our children. But these boards of health not only educate the children, but also the adults, in ways just as important to the community as the rudimentary studies pursued by the scholars in our schools. How much better off we are as a people because of the boards of health in the various towns and cities of the Commonwealth! We boast of our fire department: it preserves our property. So the boards of health preserve our property. Had we continued as we were going on in this city years ago, much of our property would have become valueless: it would have been buried in rubbish. The board of health came to our relief; and, as you go through our streets to-day, you will find they are nice and clean, for which we give thanks to the board of health. We are pleased with our po-

licemen. They do us a good service: they try the doors and windows, they keep the burglars away. But the board of health comes around, and stops the unseen enemy — ten times worse than burglars — from entering through the pipes and sewers into our rooms, and destroying more in a month than burglars ever murdered in years. Gentlemen, you are doing for the community a great service. I judge of you by our own board of health. We have a novel arrangement in the city of Lawrence for disposing of our rubbish. We have a large vacant area near the Spicket River, where, when we have anything to destroy, we set it on fire. The smoke goes with the wind; and, when the people on the leeward side complain, we wait until the wind changes, then set it again, and give it to the other fellows. It does not cost us a five-cent piece, and burns up clean everything except the mattresses, some of which we are obliged to bury.

We are in constant danger all the time. The boards of health are upon the watch-tower. We have five men connected with our board. They say nothing, but they are perfect bulldogs. When they start, they get a firm hold; and they hold on until they accomplish their purpose.

Gentlemen, a word more. They are always found fault with. That is the common custom. Last spring we thought we would have inspectors look our city over; and, as we had too many policemen at that time, we detailed two, in order to give them a little exercise, to go around and examine the buildings. The board of health put them on. Those policemen labored faithfully, and did a good work. The papers at first said, "A good thing." In a few days they began to find fault, saying that we had no business to diminish the police force. Then they said we had no right to put that kind of men on. Then they wanted to have somebody appointed under the civil service. We got it all round. When you do just what the papers want you to do, they will find fault; and, when you change in accordance with their suggestion, they will still find fault. But our five men, with their teeth set, go at the work, push it through, and succeed every time.

We had in the early part of the year a great number of Syrians come upon us. They live in a strange way. You could go into

their houses at midnight: they never lock the doors. They always keep a lamp burning, well turned down. You could turn that light up, and find 2, 4, 6,— I won't say how many more,— sleeping in the same small room, with every window closed, and not a particle of ventilation. We sent these policemen round to talk with that people, to persuade them to scatter more; and the result was a change in their method of living in the city of Lawrence.

Our Board is doing much for us; and I say to it and to every other board, Keep up your courage, go ahead. The ministers of the gospel are doing much for the community; but I would just as soon be the manager of a board of health as the pastor of a large church, because one in that position can reach all classes of the people, can build them up physically, can teach them how to live decently, and can educate them for better service in this world, thus ripening them for greater enjoyment in the world to come. So I say to you all, Take courage, make up your mind what is right, go straight forward, and tell the newspapers and all the kickers to take care of themselves, and you will attend to your own business.

THE CHAIRMAN.— In expressing my own feelings, I know I represent the feelings of every person present. I wish that Mayor Eaton would join the Association, and go with us everywhere. [Applause.]

In resuming the programme, I shall have to call for a discussion upon Dr. Abbott's paper; and let me say that remarks will necessarily be brief, in order to complete the programme. Are there any remarks to be made upon Dr. Abbott's paper? It is altogether too valuable a paper to fall flat. If it should go without discussion, I should conclude that it was because the paper had been so thoroughly considered and was so good in its character that it required considerable thought in discussing it.

If there are no remarks to be made upon this paper, I will call for the next paper upon "The Advantages of Anti-toxine in Diphtheria, and of Hospitals for Infectious Diseases," by Dr. F. G. Curtis, of Newton. Dr. Curtis being detained in court, I will ask Mr. Coffey, of Worcester, to read the paper.

Mr. Coffey read Dr. Curtis's paper, which was as follows: —

ADVANTAGES OF HOSPITALS FOR INFECTIOUS DISEASES AND OF ANTI-TOXINE IN DIPHTHERIA.

BY FRANCIS GEORGE CURTIS, M.D.

Probably the majority of those who are interested in sanitary work are agreed upon two points; namely, the great advantage of hospital treatment for infectious diseases and the marked decrease in the mortality of diphtheria under the use of anti-toxine.

Since the writer's connection with the Newton Board of Health he has become an enthusiastic advocate of both of these lines of procedure; and it is with the hope that his experience may be of use to others that this paper has been written, and most of the statements made are based upon personal observation of the working of the system in Newton.

It has been our good fortune to have had an infectious disease hospital in Newton for the past seven years, the city having furnished the funds for its erection in 1890. The buildings are upon land belonging to the Newton Hospital, and are practically a part of that institution which furnishes the physicians and nurses. The first patient was admitted in March, 1891; and since that date the board has continued the policy of urging, and in some cases compelling, the removal of infectious cases to the hospital, with the gratifying result that, out of 233 cases of scarlet fever and diphtheria reported to the Board of Health in 1897, 90 were removed to the hospital.

All classes have availed themselves of the opportunity offered by the hospital, and it is not an uncommon occurrence for persons whose means are ample for affording every comfort during sickness to ask to be sent to the hospital.

The most gratifying fact of all — and it is one to which the writer refers with pride — is that in no case have the physicians offered any opposition to the wish of the board that a patient should be sent to the hospital, but, on the contrary, have always seconded the efforts of the inspector, often turning the scale in favor of removal, thus preventing the necessity of using force to accomplish the desired end.

The benefits of hospital treatment of infectious disease fall naturally into three divisions, and may be considered separately. These are the benefit to the public at large, to the family of the patient, and to the patient himself. To the public at large the chief benefit comes in the removal of the patient from a place where he is a constant menace to public health, and putting him in a hospital where he is isolated.

It can easily be seen that removal to a hospital means great protection to the public and a simplifying of the work of the board. The majority of the hospital cases naturally come from the poorer and more thickly settled sections of the community, where it is the rule for several families to occupy a single building, often using the halls and stairways in common, and where — owing to the ignorance and poverty of the people — it is almost impossible to establish an efficient quarantine.

Even among the more intelligent members of a community it is very difficult to establish an efficient quarantine, and it must be obvious to any one that the prompt removal of the patient and disinfection of the premises offer the best chance for preventing further spread of the disease.

Of the actual money cost to the community for caring for its infectious cases in a hospital, the writer can speak only in regard to the experience in his own city, and in that for the year 1897 alone, as previous to that time it was impossible to figure the expense.

In 1897 a contract was made with the trustees of the Newton Hospital, under the terms of which the city pays a fixed rate per week for each patient sent to the hospital by authority of the board; and for that year the gross cost to the city for the care of 116 cases of diphtheria, scarlet fever, and measles, was $4,213.73.

The matter of expense is always a stumbling-block, and is one reason why it is so difficult to persuade the municipality to establish an infectious disease hospital.

The average city father looks upon the health officer as a more or less harmless crank, who may be allowed to indulge in his peculiar whims in moderation, but, when he asks for money, must be sternly repressed.

It is very difficult to make the city council understand that money

spent for the erection and maintenance of an infectious disease hospital is really an economic measure, and that the removal of one patient to the hospital for a few weeks may result in checking an outbreak of disease that would be very costly, not only to the community at large, but to individuals. It is actually cheaper to send a patient to the hospital, and pay his expenses there, than it is to attempt to establish a quarantine of the premises, as may be shown by a case which occurred in Newton a few years ago.

A case of scarlet fever occurred in a family who kept a small store, and for some reason the patient was not removed to the hospital. Owing to the fact that many people were accustomed to going to the shop, it became necessary to place guards over the house to prevent the neighbors from entering it. The cost of this averaged $10 per day; and in addition it was necessary to pay for the services of a physician, and to feed the family besides, as they had no means of supporting themselves when their means of livelihood was cut off.

The expense of this one case was from $75 to $80 per week; while the highest weekly cost at the hospital has never exceeded $17, and will often be less.

An attempt was made to obtain reimbursement from the Commonwealth, as the patient was a State pauper; but the authorities refused to allow for the pay of the guards on the plea that they were employed to protect the general public, and not for the benefit of the patient. When the patient goes, or is sent, to a hospital, the Commonwealth will allow reimbursement; and in this way the net cost to the city is lessened and the best possible protection is afforded to the general public.

A few cases similar to this one will show to the city council that it is actually cheaper in dollars and cents for the city to send infectious diseases to a hospital, and it often needs some such object-lesson to accomplish the desired end.

In a small city, where there are times when only a small number of infectious cases may be present, it seems probable that the most economical manner to conduct a hospital for infectious disease is to follow the plan which obtains at Newton, and build infectious wards in connection with some private hospital, making a contract with the

hospital authorities to care for all cases sent there by authority of the Board of Health.

Where this is done, the expense is reduced to a minimum, as the city is not compelled to be at any expense in keeping the hospital ready for use when no disease exists, and yet is able to avail itself of the hospital at any moment.

At Newton, at a time like the present, when practically no infectious disease exists, the board is under no expense for maintenance; and yet, should cases occur to-morrow which ought to be removed to the hospital, a simple telephone message is all that is needed to have everything prepared for the reception of the patient in the time that it takes to have him carried to the hospital.

There are so many small hospitals in existence now that almost every city has at least one within its limits with which it can make a contract for the care of its infectious cases, or at worst it can find one within easy reach, just as the Newton Hospital takes cases from Wellesley, Weston, Watertown, and Needham.

The benefits accruing to the family of a patient by his removal to a hospital are no less obvious than those to the public at large, and are very similar. In the first place, the prompt removal of the sick person relieves the rest of the family from the danger of possible infection, and this at the earliest moment. Where there are many other children, and few rooms for isolation, this fact is of the greatest possible advantage. Instead of having the period of quarantine strung out indefinitely by successive children coming down with the disease, it is reduced to a minimum, the actual quarantine being over in twenty-four or forty-eight hours; and all that is necessary is that the other members of the family should be held under observation until the period of incubation has passed. If the other members of the family are children of the school age, this is practically reduced to having them report for the school permit after the two weeks required by the statute have elapsed.

It also makes it possible for the other children of the school age to return to school within two weeks after the removal of the sick person.

We have found this in Newton a very powerful argument to use in favor of removal, especially when there are several children who would otherwise be compelled to remain at home.

Whether it is due to the desire of the parents that their children should not lose the benefits of school, or whether — as is more likely — they prefer to be relieved of the care of the children during part of the day, at least the fact remains that they are often willing to agree to removal when they learn that the children can return to school more quickly than when the sick one remains at home.

Among the poorer classes — who, having practically nothing laid away, depend upon their daily earnings for their subsistence — it is of the greatest possible advantage to have the period of quarantine reduced to a minimum, as happens when the sick member of the family is removed.

A six weeks' quarantine for a case of scarlet fever, for instance, by preventing the well members from attending to their daily work, may reduce a family to pauperism, with all its attendant disadvantages.

It has been found in Newton that some employers will not allow their employees to continue at work when there is a case of infectious disease in the house, even though the board is satisfied that the isolation of the sick person is satisfactory enough to make it safe for the other members of the family to go at large.

Again, if the patient is removed, the family is relieved from the necessity of preparing a room in which he may be isolated and from all the numerous little details which become necessary when a case of infectious disease is treated at home. Where the family lives in a small tenement, and is limited in the number of rooms which can be used, this is a very serious problem; and one of the two things is almost sure to happen,— either the rest of the family is herded together in a few rooms, to the great detriment of their well-being, or (and this undoubtedly is what happens most frequently) the isolation of the patient is practically disregarded, and the other members of the family use the room freely, thus being exposed to infection, and, what is worse, the directions of the board in regard to the necessity of isolation and care in handling infectious disease are disregarded, and a feeling is fostered that these directions are useless, and so the power of the board is lessened.

There can be no doubt as to the advantage of hospital treatment for the sick person himself. The dark, stuffy room of the tenement

or small house is changed for the light, airy, well-ventilated hospital ward, the well-meaning but ignorant ministration of a relative or some friend who volunteers or is hired for the work gives place to the quiet, skilled care of the trained nurse, and all the latest and most approved methods of modern treatment are at the patient's command.

Naturally, the most marked change in the method of treatment is the almost universal use of anti-toxine in the treatment of diphtheria and the great reduction of the mortality especially in hospital practice, which has followed its introduction.

Wherever we look, we find the same results shown in the reduced mortality shown under the use of anti-toxine; and, in order not to multiply figures, the writer will confine his remarks to the results which have come under his own observation, simply asking you to remember that what has occurred here in a small way has occurred everywhere on a much larger scale.

The use of anti-toxine became general in Newton in the year 1895, and the first noticeable fact was a reduction of the mortality from diphtheria throughout the city from 24.69 per cent. in 1894 to 9.93 per cent. in 1895. During the year the board kept a record of the cases treated with anti-toxine and those treated by other methods, with the result that the mortality under the use of anti-toxine was 6.61 per cent. as against 16.66 per cent. in those treated by the older methods.

No account was kept of the stage of the disease at which anti-toxine was used; but all cases were included, whether the patient was moribund at the time of administration or in the earliest stages.

For three years before 1895 the average mortality from diphtheria was 29.82 per cent.; while for three years after the general use of anti-toxine it was 10.79 per cent.,— a sufficiently gratifying decrease.

Turning to the results of anti-toxine in hospital treatment, we find that they are no less marked; for in three years previous to the introduction of anti-toxine the mortality in the diphtheria wards of the Newton Hospital was 37.5 per cent., while for the three years following its use the mortality was reduced to 10.64 per cent.

One fact in regard to the use of anti-toxine has impressed itself upon the writer; namely, that it should be used at the earliest possible moment, even before the bacteriological examination has shown

the presence of K L, provided sufficient clinical evidence of the disease exists. An analysis of 189 cases at the hospital shows that there were no deaths out of 10 cases where it was injected within the first twenty-four hours: the percentage for the second twenty-four hours was 4.16 per cent., and rose steadily to 40 per cent. where it was administered after the fourth day. To any one who recalls the discomforts of the older methods, where sprays, swabbing, etc., made up the greater part of the treatment, and compares it with the present methods, the change is almost startling enough to make him an advocate of the use of anti-toxine, even were there no other advantages to recommend its use.

Of the evils following the use of anti-toxine, very few have come under our notice. In the 189 cases referred to, albumen, in appreciable amount, was noted in but 14 cases, of which 4 died. The so-called anti-toxine rash was present in a few cases, but, judging from the hospital records, was never of sufficient seriousness to warrant more than a passing notice. 2 cases developed severe arthritic symptoms, which delayed convalescence, in one case for several weeks; but both patients finally recovered.

In October of 1896 and again in the same month in 1897 severe and almost uncontrollable gastric symptoms were noticed, which in 3 cases at least ended fatally. The physicians on duty were inclined to attribute these symptoms to some peculiar property in the anti-toxine which they were using at the time, and made a change. This change was followed by a cessation of the symptoms, and there seems reason to believe that their idea of the cause was plausible.

When we come to analyze the causes of deaths, we are met with a difficulty in the fact that the hospital records are not definite; for, on looking them over, one is met with such statements as "died suddenly," "died of exhaustion," "vomited incessantly — died," etc., so that it is impossible to arrive at any definite conclusion in regard to the cause of death. Very few of the cases seem to have died of "sepsis," and those only when the patient reached the hospital after the disease was well established.

A very noticeable fact was the increase in the number of recoveries from laryngeal cases. In former times, if the patient developed laryngeal symptoms, the case almost certainly terminated fatally;

but, under the use of anti-toxine, not only are recoveries more frequent, but it is also true that laryngeal symptoms develope much less frequently.

The dose of anti-toxine which has been found most effective is from 1,500 to 2,000 anti-toxine units, according to the age of the patient. This may be repeated, if there is no marked improvement in twenty-four hours. It has seldom been found necessary to repeat the dose a third time. This experience follows very closely that of other places, and may be looked upon as the accepted course to follow in the use of anti-toxine.

In regard to the other treatment it has been found that very little is needed. The patient's strength should be kept up by proper means, and the mouth kept clean by irrigation, preferably with the normal salt solution or a solution of boracic acid. Further than this nothing is indicated, at least in the average uncomplicated case.

We have had in Newton very little experience in the use of anti-toxine for immunization, and what we have had is not such as would recommend its use for that purpose.

During one year all nurses and attendants in the diphtheria wards were given immunizing doses of from 100 to 200 units. In almost every instance a very severe anti-toxine rash developed, in one case being so marked as to compel the nurse to go off duty for two days. Of 10 persons who were immunized in this way, 2 subsequently contracted diphtheria. The final result was that immunization of the nurses has been abandoned. This experience does not agree with that of other observers, who have found immunization quite effective.

In conclusion, the result of our experience in Newton with the hospital treatment of infectious diseases, added to the general testimony as to its advantages, has been such as to lead to the hope that in the future it will be made compulsory to send all cases of such disease, without regard to the social standing of the patient, to a hospital; for in this way it is believed that a better control over the spread of infectious disease will be obtained.

THE PRESIDENT.— This paper is open for discussion.

DR. GAGE.— I would like just two minutes to call attention to what seems to me to be a real danger from these suggestions, and I

don't feel like letting it go by, if the time is late; that is, the danger to the hospital, the patients, etc. The suggestion is to use the smaller general hospitals for these contagious cases. There is but one executive management, one house officer, one matron, and one corps of nurses; and they cannot have a separate management for these contagious wards. I have seen this danger of infection become a real danger to the other patients in the hospital; and I believe that it is not wise to introduce these cases into these smaller hospitals, but to have a separate hospital.

THE CHAIRMAN.— There are several cities represented here this afternoon where there exists the hospital for contagious diseases alone. I will call upon Dr. Chase, of Brookline.

DR. CHASE.— Mr. Chairman and gentlemen, not to take up too much of your time, I have jotted down a few things that I would like to say about the Board of Health Hospital in Brookline.

The usefulness of hospitals for the isolation and care of contagious cases, in my experience, admits of no doubt whatever. I may say the same, with almost the same positiveness, of the usefulness of anti-toxine. Some of the gentlemen present visited the three isolation hospital buildings of our Board of Health when the Association met in Brookline; but, as most of those here to-day were not present there, I should like to show this photograph of one of our buildings, and briefly describe them (exhibiting a large photograph). This photograph pretty nearly represents its companion building also. One is for diphtheria, the other for scarlet fever.

At the annual town meeting of 1894 it was voted to appropriate $5,000, asked for by the board, to construct two suitable buildings for the shelter and care of persons ill with dangerous contagious diseases, and needing isolation. We already had a building for small-pox patients, which had proved very useful. Under this vote the board, after conferring with competent authorities, had constructed, in one of the least densely populated parts of the town, two buildings, a safe distance apart, and sufficiently remote from all other buildings. The special committee consisted of the chairman of the board, one of the other members, and the agent of the board. The hospitals stand on high ground near the Brookline Country

Club, in a location of great natural beauty, with plenty of space about them for the erection of tents or portable huts, in case of an extensive epidemic. Dr. Abbott, of the State Board of Health, who kindly visited the proposed location with me, said the town was to be congratulated on owning so desirable a lot of land for such a purpose. Of course, we had objections from real estate owners in the neighborhood; but the board said: "If we are going to let them tell us where the hospital ought to be located, we won't be able to build it anywhere. We will put it right here, in the first place."

The hospitals were built without haste and in a thorough manner. The chairman of the board gave a great deal of time and attention to the details of construction and equipment, and the superintendent of buildings and the sanitary inspector of the board assisted.

The buildings are of wood, single story, pavilion style, each having three small wards, with a hallway through the middle of the building, a kitchen, cellar, and attic, and can together accommodate from twenty to twenty-five patients and attendants. We assume always that most of the patients will be children. Of course, we could not accommodate that number of adults. They were planned with special attention to securing ventilation and sunlight (though not having cross-ventilation), have plastered walls covered with Windsor cement, which permit of thorough and easy cleansing; and all the rooms, including the kitchens, have open fireplaces. Speaking of the cleansing and disinfecting, we do that with formaldehyde, and also disinfect our contagious ambulance by the same means. Both buildings have modern sanitary arrangements, public water supply, and good piazzas. One of the buildings — the smaller one — is for diphtheria patients, the other for scarlet fever. At one end of the larger building are a kitchen and small ward, wholly separate, and available, when necessary, as a probationary ward for the observation of any doubtful case. This is a valuable suggestion of Dr. Walcott of the State Board. It is often very difficult to make a correct diagnosis at the outset of a case of infectious disease; and meanwhile great danger may be incurred by the family or household with whom the patient may be residing. It is, therefore, a matter of great importance to provide a place for the patient where he will not endanger others if he proves to be infectious, and at the same time

avoid the infection of the probationer, if his illness proves later to be either a non-infectious or a less dangerous infectious disease. These rooms may also prove useful at times, after disinfection, for laundry and cooking purposes, or for occupancy by convalescents before going among children, or in times of epidemic as a reserve ward. We may multiply these buildings, and have a central administration building and kitchen later on, if we require it. Both hospitals have now been occupied many times in the last four years, and have been found comfortable and convenient for patients and nurses. The hospitals can be communicated with by telephone, and are kept always ready for immediate use.

Scarlet fever and diphtheria were almost unknown in the town during the summer vacation of 1894, during which time the hospitals were building, only three cases occurring during that period; but with the opening of the schools in September both diseases, as usual, began to be more common in the town and in the neighboring cities and towns. In September there were only two new cases of scarlet fever and six of diphtheria, and October and November furnished about the same number; while in December the number of new cases of scarlet fever increased to five, and of diphtheria to thirteen, with a number of fatal cases. The board early decided on rigid enforcement of existing regulations, and also adopted a number of important new measures to prevent, if possible, an epidemic. This was just before our hospital buildings were finished. Recognizing the fact that the proper isolation of the very first cases of contagious disease in crowded tenements, like prompt action in the first five minutes of a fire, often prevents an epidemic, on October 8, when three cases of scarlet fever appeared on the first and second floors of a certain tenement, thereby exposing over twenty other children, the board with great difficulty provided for the immediate removal of the patients to a suitable vacant house, as the hospital buildings were not promised by the contractor until November 1. Four other patients were admitted to the temporary hospital before the permanent ones were ready, all going voluntarily or with the written consent of their parents, the latter, in two instances, even requesting the board to take care of their sick children in the temporary hospital in order to protect their other children. In due time all these patients were discharged well. Meanwhile in no instance did

another case appear in their tenements or houses after their removal; while by their removal the school attendance of all the other children was interrupted but a fortnight instead of till six weeks from the commencement of the last case in the house.

The new hospital buildings had been in readiness only a month when they were urgently needed for two diphtheria patients from two populous tenements. A few days later they were joined by a third patient from the first floor of still another crowded tenement in a densely populated district. This patient's little brother, too ill for transportation to the hospital, died at home of diphtheritic croup a day or two before, though having good medical attendance and being nursed by his mother. One of the diphtheria patients, after two days in the hospital, proved to have scarlet fever also, and was removed at once to the other new building, the first patient there, and was given a special nurse. This was the first and only patient in Brookline that has had to be removed to the hospital with the assistance of a constable and warrant, and was the boy whose brother died in his tenement home. Fortunately, all of the eleven hospital patients, thanks to their good accommodations and faithful and skillful nursing, made good recoveries, and established the good reputation the hospital has ever since enjoyed.

As to the use of anti-toxine, a few words. As I usually attend the patients in our Board of Health Hospital, I have had very considerable experience with anti-toxine; and upon that I base my opinion of its curative and preventive value. Just a year ago a patient who should have had anti-toxine a week earlier than when first seen by me, and who, as a forlorn hope, had an intubation and then a difficult tracheotomy performed upon her, gave me the opportunity of experiencing severe clinical and bacteriological diphtheria and testing anti-toxine in my own person. I can truthfully say that in about twelve hours after the injection of 1,000 units of Massachusetts State Board of Health anti-toxine I felt much relieved; and with the help of two devoted medical brethren, whose modesty would prevent my mentioning their names in public, I made an uninterrupted recovery.

MR. COFFEY.— Mr. President, I will say, briefly, that Worcester two years ago established a hospital for the care of infectious diseases. That hospital is — next to the one at Boston — probably the most complete hospital for the care of infectious disease in the State.

It is open the year round, in charge of a resident physician, a lady, and trained nurses who are furnished from the school of the City Hospital. The buildings are of the separate pavilion plan, diphtheria upon one side and scarlet fever upon the other, each forty feet distant from the main administration building, which is in the centre. In the rear is a separate building, making the fourth building, in which are the laundry, a chapel, and a steam sterilizing plant.

With but one exception I can give unqualified support to the paper by Dr. Curtis, as far as our experience in Worcester is concerned. We have — as perhaps many of you are aware — a great many large educational institutions in Worcester, whose pupils are from all over the country. We have frequently been able, by means of this hospital, I think, to stop the spread of contagious disease among the pupils of those institutions. We have also two large State lunatic hospitals there, in one of which we have had two outbreaks of diphtheria, in which it was confined to the persons who were first attacked, they being removed immediately to our hospital. The hospital is able to care for fifteen patients of each disease. We do not take care of measles: scarlet fever and diphtheria are the only diseases treated. We can perhaps, by a little crowding, take care of twenty of each disease. The hospital was opened for patients two years ago the twenty-fifth day of next month. The first full year, from Jan. 1 to Dec. 31, 1897, we had 92 patients. We have not at any time forced patients to go there: we have left it entirely with themselves and the physicians to decide, feeling that the hospital was so first-class and complete in every way that it would commend itself to the people generally; and thus far we have had no reason to change our opinion in relation to that matter. Most of the cases are sent there from the poorer sections, of course; but we do have patients from the very best quarters of the city, who pay their own board. In each ward there are private rooms, with fireplaces, which they can have at an increased cost. The general tax is $10 per week in the wards, and $15 and $20 per week in the private rooms, with the use, of course, of physicians. We have a visiting staff in addition to the resident physician.

Last year, in 1897, we had 92 cases treated there,— 70 cases of diphtheria and 22 cases of scarlet fever. The mortality for the entire hospital was 6.52, for diphtheria alone was 8.57. Most of the

diphtheria cases — that is, a large proportion of them — were very bad. 18 of them were intubation cases, in which we had but two deaths. The rate for intubation cases was 11.11. The number of cases of diphtheria outside the hospital was 246, with 49 deaths,— a mortality rate of 19.91. When you compare that with the rate in the hospital, and also consider the fact that the cases which we had to treat were, most of them, bad cases, many of them moribund when they were sent to the hospital, you can easily see how much better off a patient is in the hospital under treatment than he would be if left at home, even with the very best of care. A year ago I sent my own daughter, who had diphtheria, to this hospital,— she was twelve years of age,— and I was so confident that she would be well treated that I left home after she was admitted, and went to Philadelphia, to the meeting of the American Public Health Association. She was discharged cured in ten days. I cite this instance merely to show how much confidence I had myself in the hospital; and that confidence is shared, as I am proud to say, by the physicians and general public in Worcester.

The hospital is under the care and management of the board of health. It is not built in connection with the City Hospital. And there I would disagree, as Dr. Gage has done, with the recommendations and the opinions of Dr. Curtis. I don't believe that it ought to be built in connection with a general hospital, because it is almost impossible to keep the disease out of the general hospital. Our City Hospital trustees took the same view of it that we did. At a hearing held by the Finance Committee of the city council they opposed it, as we did also, with the result that the hospital was put under the immediate charge of the board of health. It is located on a hill which those of you who are familiar with Worcester will remember seeing as you go into the city. The great State lunatic hospital is located on it. Just west of that on the same hillside, with a southern exposure, is our hospital. It is a very fine location. We have sewer connections, gas and electric lighting, and a steam sterilizing plant that has no superior in the State, I think.

THE CHAIRMAN.— Will Professor Smith favor us with a few words?

PROF. THEOBALD SMITH.— Mr. Chairman, I have simply to say, to supplement the remarks of Dr. Curtis, that the immunity resulting from an immunizing dose of diphtheria anti-toxine (200–250 units) is

supposed to last only three weeks; and, when the three weeks have elapsed, another dose must be given to continue the immunity. This may account for the occurrences related in that paper.

THE CHAIRMAN.— I feel that you are all very anxious to see the notorious filter beds. Before taking the coaches I would say that his Honor the Mayor has proposed giving you a few words of description in such a way that you will all hear it at the same time,— a thing you could not do up there, and you will see what you are called upon to look at with more intelligence after the mayor's description. Is there any one who wants to offer a word upon this last paper? If not, we will ask his Honor, the Mayor, for another good speech.

MAYOR EATON.— I will try to describe in a very few words those notorious filter beds. Our filter gallery covers an area of about 2½ acres. It is longer than it is wide. Through the centre of it lengthwise extends a large drain pipe that empties into the well in the pumping station. At right angles with this large drain are many other pipes, flowing into it. These pipes are covered by stones, first about an inch and three-quarters in diameter, then another grade a little smaller, and another smaller still, until you come up to the top; and the top is covered with a thick coating of sand. The water is let in upon that sand, continually flows over it, runs through it, enters these pipes, flows into the well, is pumped into the reservoir; and we use it, and we believe it to be very pure water. That is a brief description of the notorious filter beds.

THE CHAIRMAN.— These filter beds, gentlemen, are so notorious that there is hardly any civilized country on the globe that does not recognize them as the initiative and the finest specimen of this kind of work in the whole world. Massachusetts has led in this respect, and it is due to Lawrence most that these beds have been made so perfect. I am ashamed to say that this is the first opportunity that I have personally had to see this glorious piece of work, and I think that perhaps many of you share with me the great desire to see it this afternoon. A motion to adjourn will be in order.

On motion of Mr. Coffey the Association adjourned. Then carriages were taken; and a visit to the sewage filtration beds and to the water-works was made, under the guidance of the Mayor and Board of Health of Lawrence.

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